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Sixth Semester B.E. Degree Examination, January/February 2005

Electrical & Electronics Engineering

Transmission & Distribution

Time: 3 hrs.] [Max.Marks : 100

Note: *Answer any FIVE full questions.*

1. (a) Show how the effects of wind & ice loading are taken into account while determining the sag in a overhead line conductor. (8 Marks)

   (b) A transmission line conductor at a river crossing is supported from two towers at heights 50m and 80m above water level. The horizontal distance between the towers is 300m. If the tension in the conductor is 2000kgs., find the clearance between the conductor and water at a point midway between the towers. Weight of the conductor per metre = 0.844kg. Assume that the conductor takes the shape of a parabolic curve. (12 Marks)

2. (a) Derive an expression for the inductance of a 3ϕ unsymmetrically spaced, regularly transposed system of conductors. (10 Marks)

   (b) A $3\phi, 50Hz$. transmission line consists of three conductors of radii 12.5mm placed in a horizontal plane with a spacing of 6m between the middle and each outer conductor. Determine the inductive reactance per phase per km. of the transposed line. (10 Marks)

3. (a) Derive an expression for the line to neutral capacitance of a 3ϕ overhead transmission line when the conductors are symmetrically placed. (10 Marks)

   (b) A $3\phi, 132kV$ transmission line is connected to a 50MW load at a power factor of 0.85 lagging. The line constants of the 80km. long link are $Z = 96\angle 78^0\ \Omega$ and $y = 0.001\angle 90^0\ S$. Using nominal T-circuit representation, calculate the A, B, C, and D constants of the line and hence determine the sending end voltage and sending end current. (10 Marks)

4. (a) Deduce an expression for the sending end voltage and current for a long transmission line using rigorous method. (12 Marks)

   (b) A 220kV, 3ϕ overhead transmission line has an impedance per phase of $(20 + j100)\Omega$ and admittance of $j0.001$ ℧. Using the π - model, determine the sending end voltage and current when the current at the receiving end is 300 ampere at 0.9 p.f lagging. (8 Marks)

5. (a) Discuss the different methods of improving voltage distribution across different units of a string of insulators. (8 Marks)

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(b) A string of suspension insulators consists of four units. The capacitance between each link pin and earth is one-tenth of the self capacitance of a unit. The voltage between the line conductor and earth is 100kV. Find

i) The voltage distribution across each unit and

ii) The string efficiency. (12 Marks)

6. (a) Show that the maximum stress in a single core cable is $2V/\left(d\ log_e\frac{D}{d}\right)$ where V is the operating voltage and d and D are the conductor and sheath diameters respectively. Hence prove that $g_{max}/g_{min} = \frac{D}{d}$. (10 Marks)

(b) A single core cable has a conductor diameter of 2.5cm and a sheath of inside diameter 6cm. Calculate the maximum stress. It is desired to reduce the maximum stress by using two intersheaths. Determine their best position, the maximum stress and the voltage on each System voltage is $3\phi, 66kV$. (10 Marks)

7. (a) Prove that a uniformly loaded D.C. distributor fed at one end gives a total voltage drop equal to that produced by the whole of the load assumed to be concentrated at the centre. (8 Marks)

(b) A 2-wire D.C distributor supplies the following loads.

Load in amps	20	30	80	50
Distance from the supply end (in mtrs)	50	100	200	300

If the supply end voltage is 250V, calculate the voltage at the different load points. The resistance of the distributor is 0.0001Ω per conductor per metre. (12 Marks)

8. Write short notes on this following :

i) Corona effect in overhead lines

ii) Feeders, distributors & service mains

iii) Advantage of high voltage transmission

iv) Grading of cables.

v) Skin effect (5 × 4=20 Marks)

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EE64

NEW SCHEME

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Sixth Semester B.E. Degree Examination, July/August 2005

Electrical & Electronics Engineering

Transformers and Induction Mechanics

Time: 3 hrs.] [Max.Marks : 100

Note: *Answer any FIVE full questions.*

1. (a) Develop the phasor diagram of a single phase transformer under lagging p.f. load. **(5 Marks)**

(b) Draw the equivalent circuit of a transformer and describe briefly the various parameters involved in it. **(5 Marks)**

(c) A single-phase, 1100/220V transformer gave the following test results.

i) 1100V., 0.5A, 55W. on *hv* side, *lv* side being open circuited.

ii) 10V., 80A, 400W. on *lv* side, *hv* side being short circuited.

Draw the equivalent of the transformer and find the regulation and efficiency when supplying 100A at 220V 0.8p.f. lag. **(10 Marks)**

2. (a) Derive an expression for load division between two dissimilar transformers connected in parallel with unequal voltage ratios. **(10 Marks)**

(b) A 5kVA, single phase transformer has a core loss of 40W and full load ohmic loss of 100W. The daily variation of load is as follows

7AM to 1PM - 3kW at 0.6p.f.
1PM to 6PM - 2kW at 0.8p.f.
6PM to 1AM - 6kW at 0.9p.f.
1AM to 7AM - No load.

Determine the all day efficiency of the transformer. **(10 Marks)**

3. (a) What is an auto-transformer? Derive an expression for the saving of copper in an auto-transformer as compared to an equivalent two winding transformer. What are the advantages and limitations? **(10 Marks)**

(b) Two electric furnaces are supplied with single-phase current at 80V. from a 3 ph. 11kV. system through Scott connected transformers. The load on teaser secondary is 500 kW and on the main transformer secondary is 800 kW. Determine the line currents on the primary.

i) at u.p.f ii) 0.5 p.f. **(10 Marks)**

4. (a) Starting from the fundamentals develop the equivalent circuit of a poly phase induction motor and also draw the phasor diagram when the motor is driving a load. **(10 Marks)**

(b) The power input to a 500V. 50 Hz, 6 pole 3 ph. IM. running at 975 rpm is 40 kW. The stator losses are 1kW and friction and windage losses total are 2kW. Calculate : **(10 Marks)**

i) The slip ii) The rotor copper loss
iii) The efficiency iv) The shaft torque.

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5. (a) With a neat sketch explain the working of a double cage IM. Draw its equivalent circuit. **(8 Marks)**

(b) A 3ph. 400V., 20hp, 50Hz star connected IM, gave the following test readings (line-values)

No load : 400V., 1250 W, 9A

Blocked rotor : 150 V., 4000 W., 38 A.

Stator copper loss equal to rotor copper loss at stand still. Draw the circle diagram and estimate :

i) Full load current

ii) Full load p.f

iii) Full load stiop

iv) ratio of maximum torque to full load torque. **(12 Marks)**

6. (a) Describe the different speed control methods of a 3-ph induction motor. **(10 Marks)**

(b) With the help of a neat diagram explain the working of a star-delta starter to start a 3-ph induction motor. **(6 Marks)**

(c) A 3-ph induction motor in a short circuit current equal to 4 times the full load current. Determine the starting torque as a percentage of full load torque if full load slip is 2.5%. **(4 Marks)**

7. (a) Explain double field revolving theory as applied to a single phase induction motor and prove that it cannot produce any starting torque. **(10 Marks)**

(b) With neat sketches explain the construction, working and applications of

i) Split phase and

ii) Capacitor start single phase induction motors. **(10 Marks)**

8. Write notes on any FOUR of the following :

(a) Cooling of transformers

(b) Polarity test

(c) Sumpner's test

(d) Losses in induction motor

(e) Cogging and crawling

(f) Induction generator. **(4×5=20 Marks)**

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